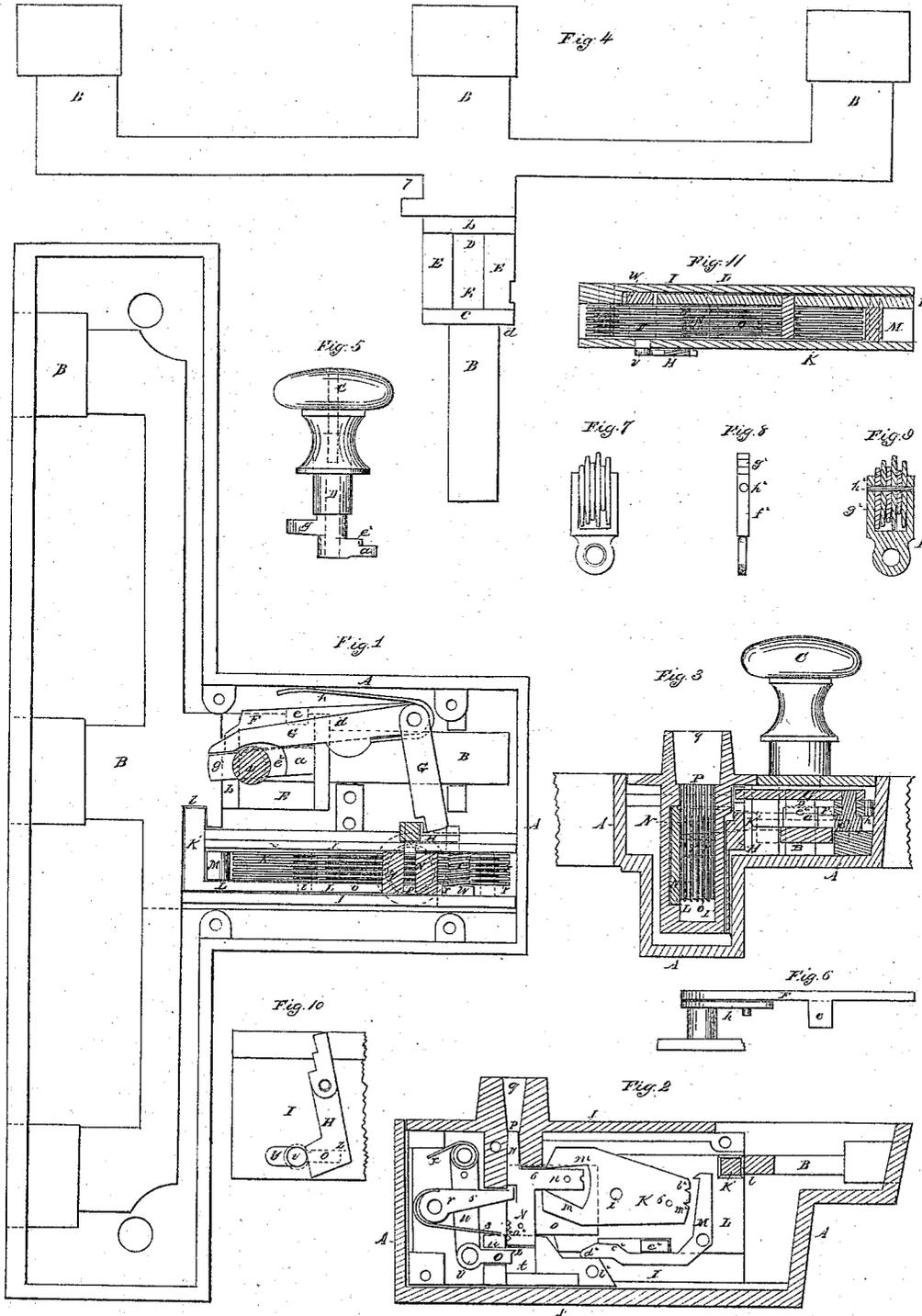


*W. Hall,  
Lock.*

*N<sup>o</sup> 37,290.*

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*Witnesses  
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN LOCKS.

Specification forming part of Letters Patent No. 37,290, dated January 6, 1863.

### *To all whom it may concern:*

Be it known that I, WILLIAM HALL, a citizen of the United States of America, and a resident of Brookline, in the county of Norfolk and State of Massachusetts, have made a new and useful invention of certain Improvements in Locks for the Doors of Bank Vaults, Safes, &c.; and I do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 denotes an inner side view of a lock provided with my invention. Fig. 2 is a transverse section taken across its key-entrance. Fig. 3 is a transverse section taken through all the key-slides and the key-hole. Fig. 4 is a side view of the main bolt. Fig. 5 is a side view of the knob-shaft and its cams. Fig. 6 is a rear side view of the stopping-dog of the main bolt. Fig. 7 is a side view, Fig. 8 an edge view, and Fig. 9 a longitudinal section, of the key.

The nature of my invention consists in the combination and arrangement of one or more studded key-slides, a corresponding number of tumblers, a catch-lever, and an auxiliary slide, or its equivalent, the whole being applied to the main bolt and lock, as hereinafter specified; also, in the peculiar arrangement and application of the main bolt with such key-slides, catch-lever, and slide; also, in the combination and arrangement of an auxiliary bolt or movable stud and its actuating apparatus, with one or more studded key-slides, a corresponding number of tumblers or slide-plates, and a catch-lever and slide, combined with the main bolt, substantially as hereinafter specified; also, in the combination and arrangement of a tooth and one or more notches, or equivalents therefor, with the auxiliary bolt and the system of key-slides; also, in the application of the auxiliary bolt to its supporting-lever or to the lock, so that the said bolt and either of the key-slides, when in engagement, may be capable of being moved together in manner and under circumstances as specified; also, in a peculiar construction of the key—viz., with its bits separately revoluble on a pin, so that either extremity of each bit may be employed in operating a key-slide. By so making the key it is susceptible of a much greater number of changes than when constructed in such manner that one

end only of each bit may be used as a means of aiding in effecting the opening of the lock.

In the drawings, A denotes the lock-case within and to which the main bolt B is adapted, so as to be capable of being moved forward and backward. These movements of the bolt may be produced by rotating the knob C one hundred and eighty degrees, a cam, *a*, on the shaft D of the knob being made to successively operate against the opposite sides, *b c*, of a recess, E, formed in the bolt. The bolt, like those of most locks, has a stopping-dog, F, which is actuated or elevated so as to raise its stud *e* (see Fig. 6) out of its bolt-notch *d* by means of a cam, *e'*, fixed on the knob-shaft. A spring, *h*, is applied to the said dog to force it in an opposite direction. Another cam, *g*, on the knob-shaft serves to operate a bent lever, G, whose shorter arm is placed against that of another lever, H, which is arranged on the outside of a secondary case, I, as shown in Fig. 10.

The case I contains the tumblers, their bolt-slide, and other mechanism, to be hereinafter described. The series of tumblers is shown at K in Fig. 2, and at K K K, &c., in Fig. 11, which is a section of them, their separating-plates, the key-slides, and their spring-levers. Each tumbler of the series turns on one common pin, *i*, which projects from the bolt-slide L. A bent lever latch or dog, M, is applied to the said bolt-slide, and serves to catch into the tumblers and hold them in their proper positions while the main bolt is advanced.

The necessary vibratory movements of the dog M are effected by means of the movements of the bolt-slide L, and by two cams, *b'*, *e'*, one of which is attached to the lock-case I and the other is a part of the dog. One acts against one end of the tail *d'* of the dog, while the other acts against a stationary stud, *e'*, extended from the said case I.

A projection, K', from the bolt-slide L enters a recess, *l*, made in the main bolt, and by so doing couples the bolt and the bolt-slide, so that each may move simultaneously, and the latter be moved by the former.

Each tumbler is provided with an opening or recess, *m*, to receive the stud *n* of one of a series of key-slides, N, N, &c. Each key-slide and its tumbler may be separated from those next to it by means of an interposing plate, *o*. The several key-slides extend into

a rectangular key-hole,  $p$ , provided with a tapering mouth,  $q$ . They fill the said key-hole so that nothing but the bits of the key can enter it and act against them respectively.

Each of the key-levers has a spring-lever,  $r$ , for forcing it toward the key-hole, these levers, with their springs  $s$  being arranged as shown in the drawings. The series of key-slides is placed within a groove or channel,  $t$ , out of which and near its rear end is an opening or passage,  $u$ , for the reception of an auxiliary bolt,  $O$ . This bolt turns on a cylindrical stud,  $v$ , extending from a carrier-lever,  $w$ , which has a spring,  $x$ , by which the lever is caused to press the auxiliary bolt  $O$  in a direction toward the key-slide channel  $t$ . The stud  $v$  not only extends through a slot,  $y$ , made through the side of the case  $I$ , but rests against one edge of the longer arm of the lever  $H$ .

A small tooth,  $z$ , is formed on the inner end of the auxiliary bolt  $O$ , and is to operate with a series of notches made in each key-slide,  $N$ , as shown at  $a^2$ , in Fig. 2. The passage  $u$  may be made somewhat wider than the auxiliary bolt, in order that the latter may vibrate on its stud  $v$ , for a purpose to be hereinafter explained.

The key shown in Figs. 7, 8, and 9 consists of a forked frame,  $f^2$ , and a series,  $g^2$ , of changeable bits. Each of the said bits is a short and straight bar of metal. They vary in their lengths, and all are supported by and turn on a common screw-pin,  $h^2$ , which passes through them and one of the prongs of the forked frame, and screws into the other of the said prongs, as shown in Fig. 9. This peculiar construction of the key enables either end of each of the bits to be used against the key-slide corresponding to such bit, and, consequently, the key is thereby rendered susceptible of a very much greater number of changes of its bits than would be the case were it so made that only one end of each bit could be used against a key-slide. I would observe that the screw-pin hole made in each bit is to be arranged nearer to one than the other end of the bit, the distance varying in every bit. This construction of the key renders it necessary to have two notches,  $l^2$ ,  $m^2$ , in each of the tumblers, in order that the dog  $M$  may perform its office according as either end of the bit corresponding to any key-slide may be employed against such key-slide.

Each tumbler, as well as the key-slide and bit thereof, should have a corresponding number or device marked on it—that is to say, the first bit should be numbered 1, its key-slide as well as its tumbler should have the same number marked on it. The next bit may be numbered 2, which number should be put on its key-slide and tumbler. Whenever any changes of the bits other than turning them on their supporting-pin are to be made, care should be taken that corresponding changes of the key slides and tumblers be also effected.

A lock constructed on the above plan will not only be powder-proof, but be capable of effectually resisting attempts to pick it, for it will be seen that while the main bolt is advanced and the stopping-dog  $F$  holds it in its advanced position the auxiliary bolt  $O$  will generally be within the groove  $t$  of the key-slides and, therefore will prevent the said slides from being forced inward sufficiently to move the tumblers into the correct positions for the projections or studs of the key-slides to enter such tumblers. It will also be seen that preparatory to the insertion of the key into the lock the knob should be revolved far enough to cause the auxiliary bolt  $O$  to be drawn out of the key-slide groove  $t$ . Now, under this latter state of things, should any one of the key-slides be forced inward and an attempt at the same time be made to force back or retract the main bolt by revolving the knob, the tooth of the auxiliary bolt will catch into a notch of the said key-slide and retain the slide. As the auxiliary bolt is free to vibrate a little laterally, a picklock, when a key-slide is so caught, would suppose that the stud  $n$  thereof had entered the fork or recess of its tumbler, for, finding he could move the key-slide a little back and forth and apparently against stops, he would naturally conclude that its stud had been caught within the tumbler-opening. The advantage of the tooth of the auxiliary lever and the notches of the key-slides will thus be apparent.

Each key-bit should be numbered on two of its opposite sides or edges, the number on one edge being reversed in position with respect to that on the other. Each number should be placed at a like distance from the axis of the hole for reception of the screw-pin. This will cause the numbers on either side of the recess of bits to be in a straight line.

In order to open the lock the knob should first be revolved so as to retract the auxiliary bolt. Next, the key should be inserted in the key-hole and pressed firmly against the key-slides. The movement of the knob should next be reversed, so as to raise the stopping-dog and force back the bolt. The key must also be used preparatory to any advance of the main bolt—that is to say, the key must be inserted in the key-hole and pressed against the key-slides, after which, by turning the knob, the bolt may be advanced.

In ordinary tumbler-locks the bolt-stud, which operates with the recesses of the tumblers, projects directly from the bolt or a slide connected therewith; but in my improved lock  $I$  employ a stud for each tumbler and project such stud from one of the key-slides. This enables me to use key-slides, and, consequently, a key-entrance so insulated from the case or interior chamber of the lock as to prevent the introduction of gunpowder into such chamber by means of the key-hole, the key-slides constituting an obstacle to such introduction. The peculiar construction of

the lock prevents the introduction of any implement through the key-hole and into the lock-case in order to gain access to the tumblers.

Having thus described my said lock, what I claim therein is as follows:

1. The combination and arrangement of one or more studded key-slides N N, a corresponding number of tumblers, K K, and catch-lever M, and the auxiliary slide L, or its equivalent, the whole being applied to the main bolt, substantially as specified.

2. The arrangement and application of the main bolt B with its key-slides N, tumblers K, and catch-lever M and slide L.

3. The combination and arrangement of the auxiliary bolt O and its actuating apparatus (or retracting-spring and system of levers operated by the knob) with one or more studded key-slides N N, a corresponding number of

tumblers, a catch-lever, M, and a slide, L, combined with the main bolt.

4. The combination and arrangement of the tooth  $z$  and the notches  $a^2$ , or mechanical equivalents therefor, with the auxiliary bolt and its system of key-slides.

5. The application of the auxiliary bolt to its supporting-lever or to the lock, so that the said bolt and either of the key-slides, when in engagement, may be capable of being moved together in manner and under circumstances substantially as specified.

6. The key as constructed with its bits separately revoluble on a pin, in order that either extremity of each bit may be employed in operating a key-slide.

Witnesses:

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